

**Progressive Rail, Inc. and
Great Plains Sand, LLC**

Scott County, Minnesota

NOISE ASSESSMENT

Prepared for

Progressive Rail, Inc.

by

David Braslau Associates, Inc.

23 August 2011

EXECUTIVE SUMMARY

This *Noise Assessment* presents estimates of sound levels that can be expected at residential land uses and at receptors in the Minnesota Valley National Wildlife Refuge, Louisville Swamp Unit. Mitigation measures incorporated in the site plan are discussed as well as additional measures that can minimize sound levels at residences and in the Louisville Swamp unit. The primary objective of this study is to ensure compliance with the Minnesota state noise standards. Sound levels from equipment in the mine area and the Processing Plant have been estimated based upon source sound levels taken from previous studies or manufacturer's data.

Sound levels from traffic on TH 169, which runs along the east side of the property, are also estimated for the adjacent residential land uses. Predicted sound levels from the mine site and Processing Plant are compared with these levels to provide a measure of potential impact of the mine relative to existing sound levels

Sound levels are estimated for the most critical equipment working in the area with highest noise levels - the wheel loader, excavator and haul trucks - since they will be operating throughout the day in the mine. The dredge will operate at the lowest accessible mine level. Sound levels are estimated for internal haul truck movements between the mine and the Processing Plant.

The loader, crusher, wet screen and dryer are the primary outdoor sources at the Processing Plant. Sound levels are predicted from the crusher/wet screen/loader area and dryer to be located on the east side of the existing building. Railcar loading is not expected to generate new significant sound levels. Since the Processing Plant will continue operating at night, noise levels from the Processing Plant are compared with the state nighttime noise standards.

None of the predicted levels from mining operations combined with haul truck and Processing Plant levels are estimated to exceed the daytime L50 60 dBA standard. Except for the residential receptor southwest of the site, which is some distance from TH 169 estimated L50 levels from TH 169 levels are already well above the predicted mine-related levels.

None of the predicted levels from nighttime operation of the Processing Plant are estimated to exceed the nighttime L50 50 dBA at residences or in the Louisville Swamp.

Mitigation measures incorporated in the site plan include screening berm, use of some equipment engineered for better sound control, and strategic placement of stockpiles. Additional measures for minimizing noise in the community and the Louisville Swamp Unit include higher berm elevations in some locations, a blasting plan and quieter backup alarms.

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1.0 INTRODUCTION

1.1. Report Objective

This *Noise Assessment* presents estimates of sound levels that can be expected at residential land uses and at receptors in the Minnesota Valley National Wildlife Refuge, Louisville Swamp Unit. Mitigation measures incorporated in the site plan are discussed as well as additional measures that can minimize sound levels at residences and in the Louisville Swamp Unit. The objective of the report is to ensure compliance with the Minnesota state noise standards.

1.2. General Approach and Assumptions

Sound levels from equipment in the mining area and the Processing Plant have been estimated based upon source sound levels taken from previous studies or manufacturer's data. These levels are compared with the Minnesota state noise standards (Mn Rules 7030.0040) shown in **Table 1.1**.

Table 1.1 Minnesota Noise Standards.

Noise Area Classification	Daytime		Nighttime	
	L ₅₀	L ₁₀	L ₅₀	L ₁₀
NAC-1 (residential and sensitive areas)	60	65	50	55
NAC-2 (commercial)	65	70	65	70
NAC-3 (industrial)	75	80	75	80

The NAC-1 or residential noise standards govern the residential land uses adjacent to the proposed mine. The NAC-1 level is also used here as the standard to be met in the Louisville Swamp Unit since this was recommended in the proposed Conditional Use Permit for the Q Prime Amphitheater which was proposed earlier on the same parcel.

“The State of Minnesota's NAC-1 standards shall be met at the residential receptors and the adjacent affected eastern boundary of the Louisville Swamp Unit (LSU) of the Minnesota Valley Wildlife Refuge. Failure to maintain compliance with prescribed standards shall be cause for immediate suspension of scheduled events by the County's Community Development Director and continuing violations shall be grounds for revocation of the Conditional Use Permit by the County Board.”

Operations in the mine are proposed in summer months between 7 am and 7 pm, so the daytime standards apply to this activity. The Processing Plant is proposed to operate on a 24 hour basis 7 days per week both summer and winter so the nighttime standards will apply to plant operation.

The proposed mine layout is shown in **Figure 1.1**.

Sound levels are also estimated for the adjacent residential land uses from TH 169 which runs along the east side of the property. Predicted sound levels from the mining area and Processing Plant are compared with these levels to provide some information on potential impact of the mine relative to existing sound levels.

1.3. Report Components

Section 2.0 describes the equipment and operations at the mine including assumed sound levels associated with the equipment.

Section 3.0 describes the modeling and assumptions used in this study.

Section 4.0 presents and discusses predicted sound levels.

Section 5.0 of this report discusses mitigation measures incorporated into the site plan and operation and others to ensure compliance with state noise standards at adjacent residences and in the Louisville Swamp Unit.



2.0 MINE EQUIPMENT AND OPERATIONS.

The following equipment is anticipated at the mine.

Summer operations

Mining Area

- Drilling for blast holes - intermittent for periods of 15-20 minutes (estimated sound level ~ 70 dBA at 50 ft)
- Blasting - intermittent - several times per week
- On-site haul trucks - approximately 8 trips each hour from the mine area to the processing area and 8 trips back to the mine. (assumed level of 86 dBA at 50 ft)
- Wheel loader – (assumed operating L50 level of 81.6 dBA at 50 ft)
- Excavator (estimated level of 78 dBA at 50 ft)
- Dredge or dragline (operated only at water level – generally at elevation ~730 – estimated level of 78 dBA at 50 ft)
- SureStrike hammer (to break up larger pieces ~15 times per hour – sound level depends on equipment used to transport and hold the hammer - limited impact sound level at 50 ft since radiating surface of sandstone block relatively small).

The most critical pieces of equipment are the wheel loader, excavator and haul trucks since they will be operating throughout the day in or near the mine. The haul trucks will travel to and from the mining area over existing terrain to reach the Processing Plant. The dredge or dragline will operate at the lowest accessible mine level in lieu of at least one of the wheeled or tracked vehicles. The drilling sound level is about 10 dBA lower than the other sources and will not be a major contributor to sound levels. The SureStrike hammer will work with smaller blocks of sandstone which will not radiate much sound. This will likely be mounted to a smaller vehicle with low sound levels. Blasting will be periodic and not a major contributor to the overall noise profile.

Processing Plant

- Dryer - outside and east of the building (estimated level of 85 dBA at 50 ft)
- Wheel loader (estimated level 81.6 dBA at 50 ft)
- Jaw Crusher (sandstone – not hard rock) (estimated level of 75 dBA at 50 ft)
- Wet screen (estimated level of 70 dBA at 50 ft)
- Rail loading (spur line – self propelling – no locomotive needed to move individual cars during the loading process)

The crusher/wet screen/loader and dryer are the primary outdoor noise sources at the Processing Plant. Railcar loading will occur on a sloped track so that a locomotive is not required to move each car. Locomotive activity will occur periodically and will not significantly increase rail traffic on the existing track.

Winter Operations

Processing Plant only

- SureStrike hammer (see above)
- Loader (see above)
- Jaw Crusher (see above)
- Dryer (see above)
- Rail loading (see above)

The loader/crusher and dryer will be the most critical noise generating equipment associated with the Processing Plant.

3.0 NOISE MODELS AND ASSUMPTIONS

3.1 Mine Area Sound Levels

The wheel loader and excavator are the most critical pieces of equipment for predicting sound levels since they can run almost continuously at the mine face and have levels 10 dBA or more above drilling noise. To ensure conservative or worst case sound level predictions, it is assumed that the loader and the excavator operate simultaneously.

Previous sound level measurements of a CAT 988 Wheel Loader at another sandstone mine yielded an L50 level of 81.6 dBA, i.e. the level that was exceeded for 50% of an hour. That level has been used in this study.

For the analysis, it is assumed that the loader and excavator are running simultaneously so that the sound levels of each are combined using decibel addition into a single source of 83.2 dBA with an assumed source height of 10 feet above ground level.

An outdoor sound propagation model incorporating data and recommendations from the ISO standards 9613-1 and 9613-2 has been used to predict sound levels at the three closest residences to the proposed mine. The mine layout and existing topography was shown in **Figure 1.1**. A recent aerial photograph of the site is shown in **Figure 3.1**. The three closest residences are shown on each of the figures. They are identified in the analysis as Res1-SW, Res2-SE and Res3-NE. The Minnesota River Valley and Louisville Swamp Unit is shown on the left. A layout of assumed mining operations is shown in **Figure 3.2**. Predicted sound levels were based upon mining phases (labeled here as A, B, C and D) representing the planned four mine phases. Mine area A, B and C, respectively, are closest to each of residential receptor sites to yield the highest expected levels from mine operations at each of these sites. Sound level predictions have been made for a mine floor elevation of 730 ft MSL which is the initial mining elevation and will remain essentially at this level as mining progresses to the north.

The loader/excavator is assumed to be distributed around the perimeter of each mine area to provide a range of expected sound levels at each of the receptor sites.

A berm at the southwest corner of the property closest to Res1-SW is assumed to be 10 feet high due to the close proximity of operations to the home. With a 2.5:1 slope, the base of this berm will be approximately 50 feet. A second screening berm is assumed along the east property line with a height of 6 feet on a 30 foot base.

3.2. Haul Truck Sound Levels

Internal haul truck roads are also assumed as shown in **Figure 3.2** for each of the four mine areas analyzed. It is assumed that eight truck trips from the mine area to the Processing Plant and back to the mine area are made each hour. Noise from the haul trucks is predicted using the MinnNoise model incorporating the haul truck with a sound level of 86 dBA at 50 feet when traveling at 15 mph. Since the trucks will be operating simultaneously with mining, the sound level from the haul trucks is combined with the mine face noise to yield overall sound levels at the residential sites.

3.3. Processing Plant Sound Levels

The primary noise sources at the Processing Plant will be a crusher with a loader or loader/excavator and dryer which will operate both day and night. The crusher operations will have a relatively low sound level due to softness of the sandstone. The same outdoor sound propagation model used for mine area sources has been used for these sources. Since the Processing Plant will continue operating at night, noise levels from the Processing Plant will be compared with the state nighttime noise standards. Location of the dryer and crusher along with associated stockpiles are also shown on **Figure 3.2**. The dryer is located on the east side of the plant building and is therefore shield from the Louisville Swamp receptors by the building. Conical stockpiles west of the crusher provide some shielding of sound to the west while the larger stockpile area provides some shielding of dryer noise to the east.

3.4. TH 169 Sound Levels

Trunk Highway 169 separates two of the three residential receptor sites from the mining operation and is also a major generator of noise. Hourly traffic volumes for July 2010 for a traffic count location several miles south of the site are shown in **Figure 3.3**. From the figure, it can be seen that, during a typical summer weekday, the minimum two-way traffic during the proposed operating time of the mine (7 am to 7 pm) is about 1250 vehicles per hour. During early morning hours, traffic volumes drop to about 50 vehicles per hour.

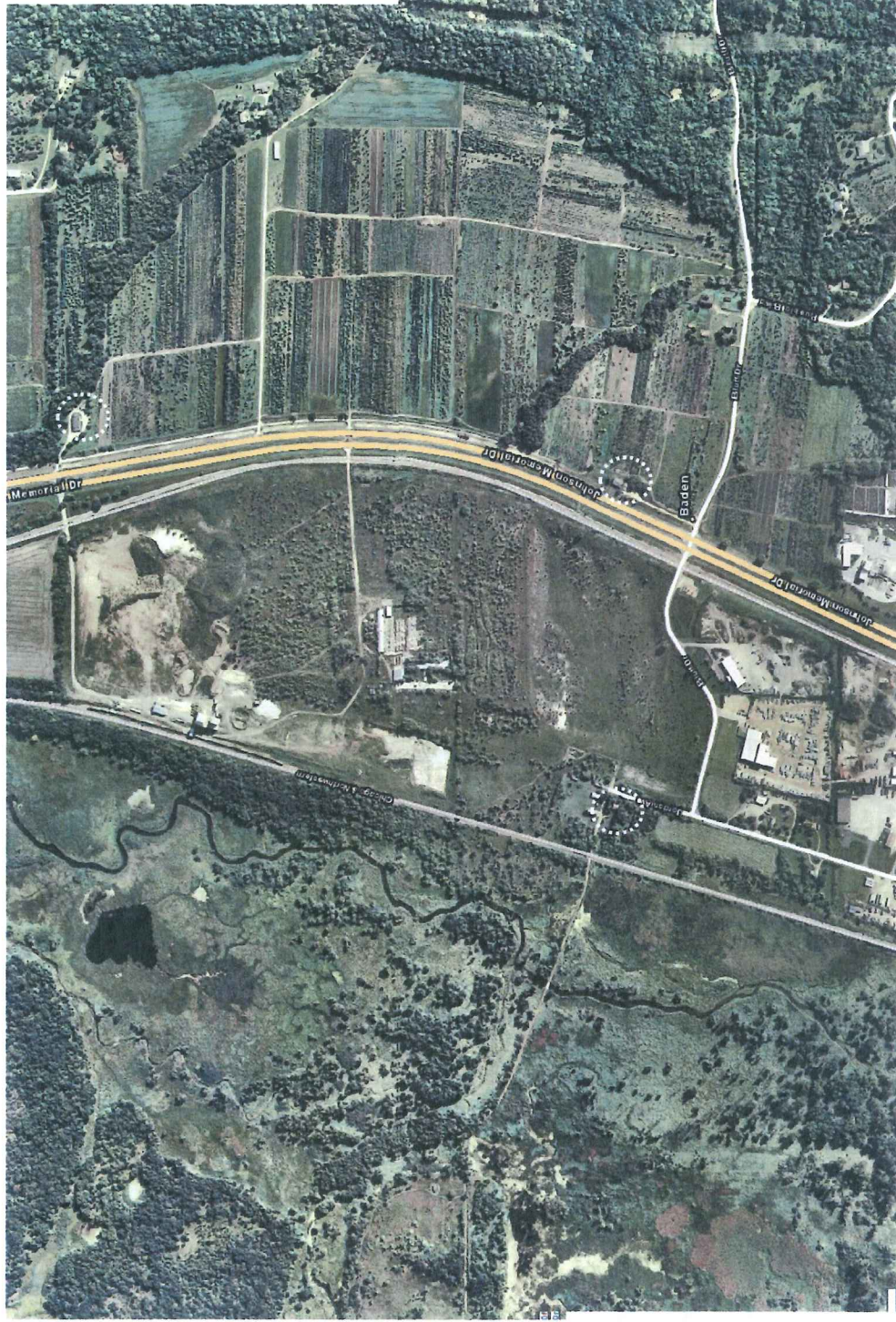


Figure 3.1 Site Aerial with Adjacent Residences and the Minnesota River Valley

Site Geometry

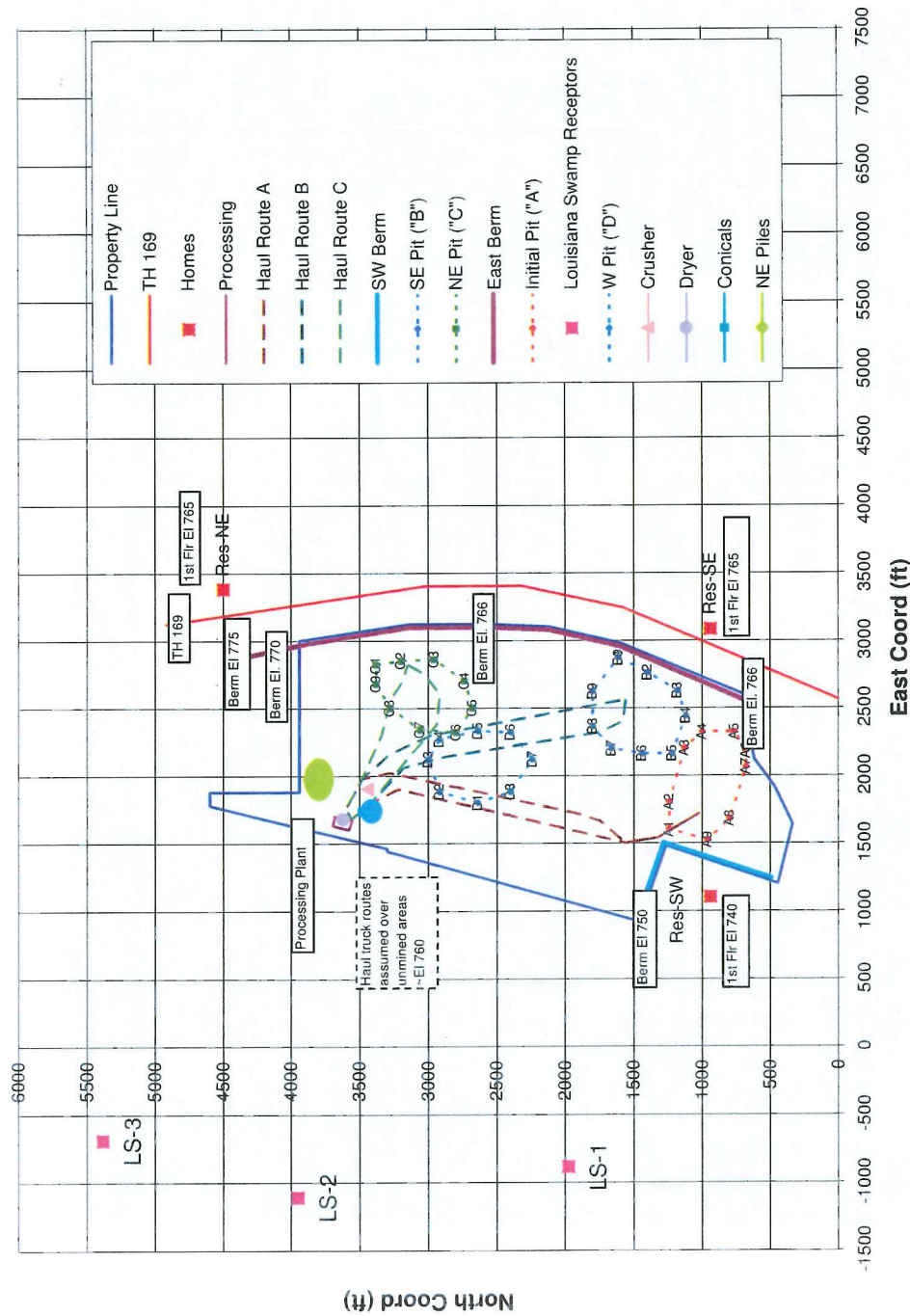


Figure 3.2 Assumed Geometry for Sound Level Monitoring

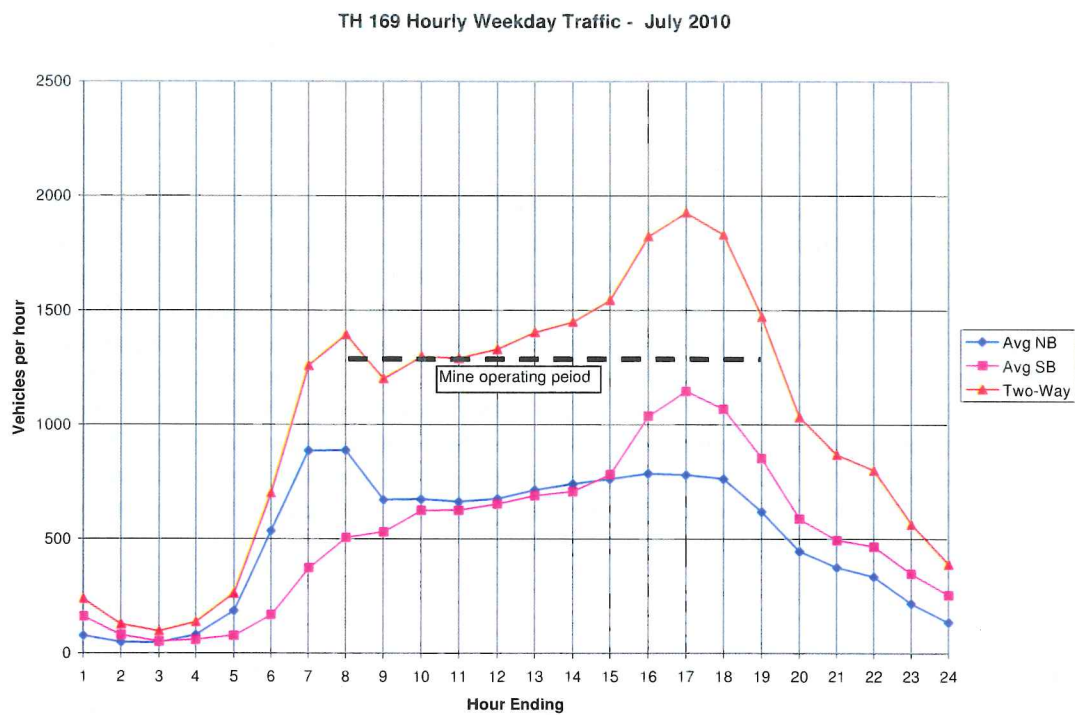


Figure 3.3 TH 169 Hourly Traffic Distribution

4.0 PREDICTED SOUND LEVELS.

4.1. Mining Sequence Considerations in Model Predictions

This noise assessment examines sound levels associated with four consecutive phases of mining. Mining operations are assumed within a defined mine area in each of the four phases.

Phase 1

Mining will begin in a previously mined area with floor elevation of 730, thus providing some immediate shielding from terrain. Haul trucks traveling to and from the Processing Plant will exit the mine area and travel over existing terrain at a typical elevation of 760 [ft]. Screening berms are planned for the southwest corner of the mine as indicated on **Figure 3.2**. These are assumed to be 10 feet above grade (top elevation of 750) to provide shielding of the residence immediately southwest of the mine. Another screening berm with a nominal height of 6 feet (top elevation 766) will extend the entire length of the property just west of TH 169. Because of higher terrain at the north and south ends of the site, the top elevation could reach 775 at each end. Mining operations will occur only during daytime hours 7 am to 7 pm, within the “daytime” period (7 am to 10 pm) contained in the state noise standards. The crusher/wet screen/loader and dryer at the Processing Plant will operate 24-hours.

Phase 2

Mining will proceed to the north from Phase 1 with a floor elevation of 730. Again haul trucks will exit the mine area and travel to and from the Processing Plant at an elevation of 760. The berms erected for Phase 1 will remain in place for this phase. The Processing Plant will operate 24 hours..

Phase 3

Mining will continue to the north from Phase 2 with a floor elevation of 730. Haul trucks will travel a shorter distance to the Processing Plant, again at an assumed elevation of 760. The previously erected berms will remain in place. The Processing Plant will operate 24 hours.

Phase 4

Mining will proceed toward the west from Phase 3. Initial shielding to the west (Louisville Swamp Unit) will be provided by existing terrain at an elevation of 760. Haul trucks will travel primarily at an elevation of 730, climbing to an elevation of 750 at the Processing Plant at the north end of the mine.

Retention ponds will be constructed along the west boundary of the property as shown on **Figure 4.1** with an effective berm of elevation 740 providing less shielding of mining noise to the west. However, with a mine floor elevation of 730 to the east and receptors in the Louisville Swamp Unit at approximately an elevation of 715, this berm will still provide substantial shielding for mining operations. The Processing Plant will operate 24 hours.

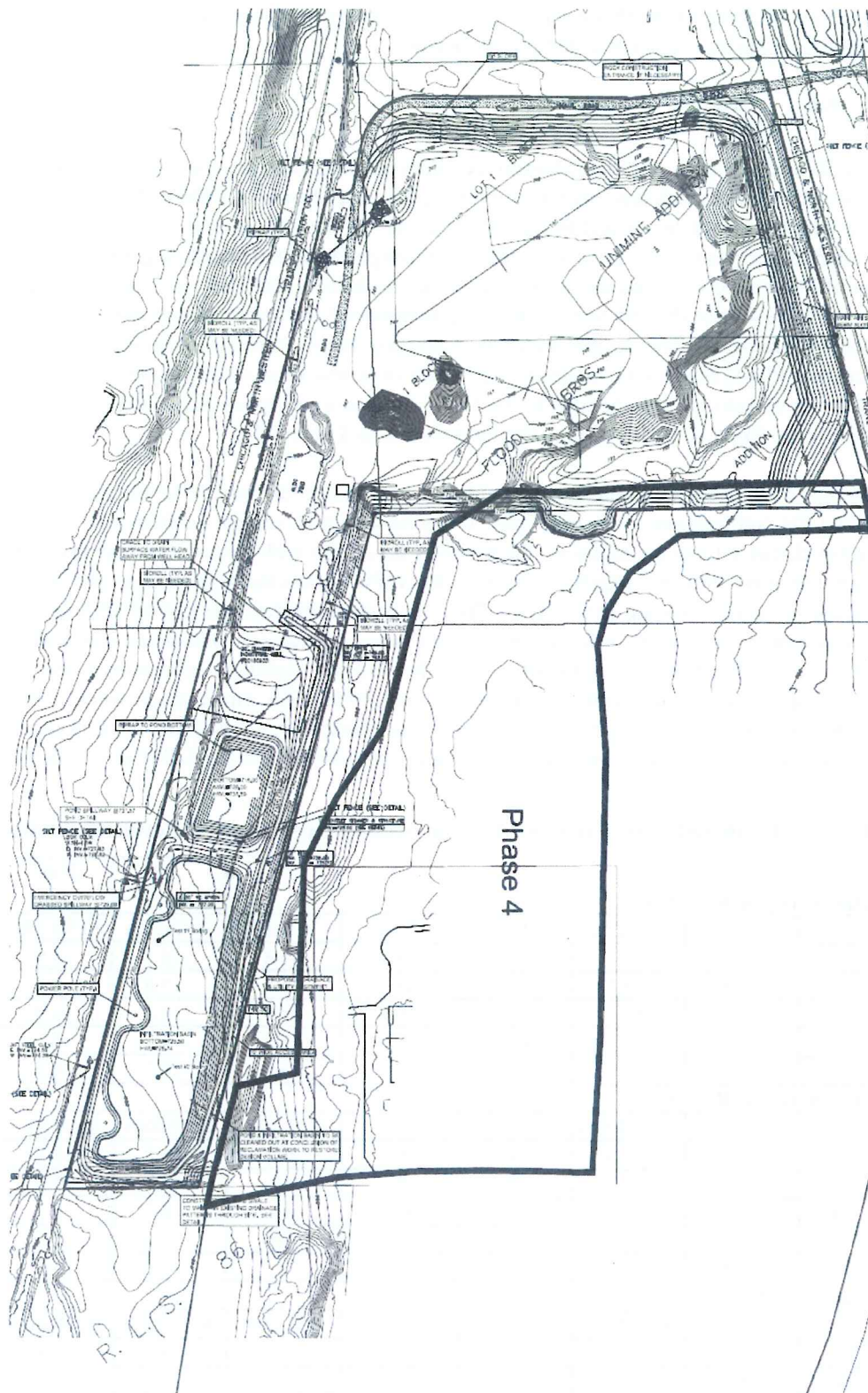


Figure 4.1 Phase 4 and Retention Basins

No permanent shielding of the Processing Plant area is currently planned although strategic placement of stockpiles can serve as temporary berms.

4.2. Predicted Sound Levels

Average L50 levels at each of the residential receptors based upon nine operating positions around the perimeter of each representative mining phase are shown in **Table 4.1**. These are combined with haul truck levels and Processing Plant levels to yield overall L50 levels at the three residential receptor sites. Levels for Phase 1 through Phase 4 with a topographic shielding elevation of 760 on the west and the screening berms (Southwest and East) are shown along with levels from Phase 4 once the 760 terrain shielding is removed and the retention pond berm (Elevation 740) remains. The decibel addition of all three levels (mining equipment, haul trucks and Processing Plant) ensures a conservative estimate of sound level since the prevailing wind during summer months is from the SSE to the NNW as shown in **Figure 4.2**, and therefore, the overall levels are likely to be lower than the total shown in **Table 4.1**.

The combined L50 levels are compared in **Table 4.1** with the predicted L50 level caused by traffic along TH 169 between 7 am and 7 pm. It can be seen that, except for Res1-SW which is a considerable distance from the highway, the highway levels are well above expected daytime levels from the mine. Phase 1 which is closest to Res1-SW shows the highest expected overall level. Predicted mine levels are generally 20 dBA lower than the daytime L10 65 dBA at the residential receptor sites except at Res1-SW during Phase 1 operations. However, it is still predicted to be 10 dBA below the standard. Sound levels from nighttime operations at the Processing Plant are compared with the state nighttime L50 50 dBA standard and found to be below nighttime standards. The critical role of the Processing Plant during nighttime hours can be seen in the table where predicted plant levels range from 45 dBA at Res1-SW to 48 dBA at Res3-NE

Table 4.1 Predicted L50 Levels (dBA) from Mining Operations at Residential Sites

						All Sources	Plant only
Residential Receptor Res1-SW							
Source	Mine	Haul Truck	Plant	Total	TH 169	Re65dBA	Re50 dBA
Phase 1-760	51.4	47.2	45.1	54.8	45.8	-10.2	-4.9
Phase 2-760	46.3	39.1	45.1	49.2	45.8	-15.8	-4.9
Phase 3-760	39.0	32.1	45.1	46.2	45.8	-18.8	-4.9
Phase 4-760	43.4	34.1	45.1	47.5	45.8	-17.5	-4.9
Phase 4-740	43.4	34.1	45.1	47.5	45.8	-17.5	-4.9
Residential Receptor Res2-SE							
Source	Mine	Haul Truck	Plant	Total	TH 169	Re65dBA	Re50 dBA
Phase 1-760	49.3	37.5	44.5	50.8	65	-14.2	-5.5
Phase 2-760	38.6	38.3	44.5	46.3	65	-18.7	-5.5
Phase 3-760	40.7	39.1	44.5	46.8	65	-18.2	-5.5
Phase 4-760	43.8	35.3	44.5	47.4	65	-17.6	-5.5
Phase 4-740	43.8	35.3	44.5	47.4	65	-17.6	-5.5
Residential Receptor Res3-NE							
Source	Mine	Haul Truck	Plant	Total	TH 169	Re65dBA	Re50 dBA
Phase 1-760	36.6	40.7	48.2	49.2	61.8	-15.8	-1.8
Phase 2-760	38.6	41.7	48.2	49.4	61.8	-15.6	-1.8
Phase 3-760	46.5	32.6	48.2	50.5	61.8	-14.5	-1.8
Phase 4-760	42.2	33.6	48.2	49.3	61.8	-15.7	-1.8
Phase 4-740	42.2	33.6	48.2	49.3	61.8	-15.7	-1.8

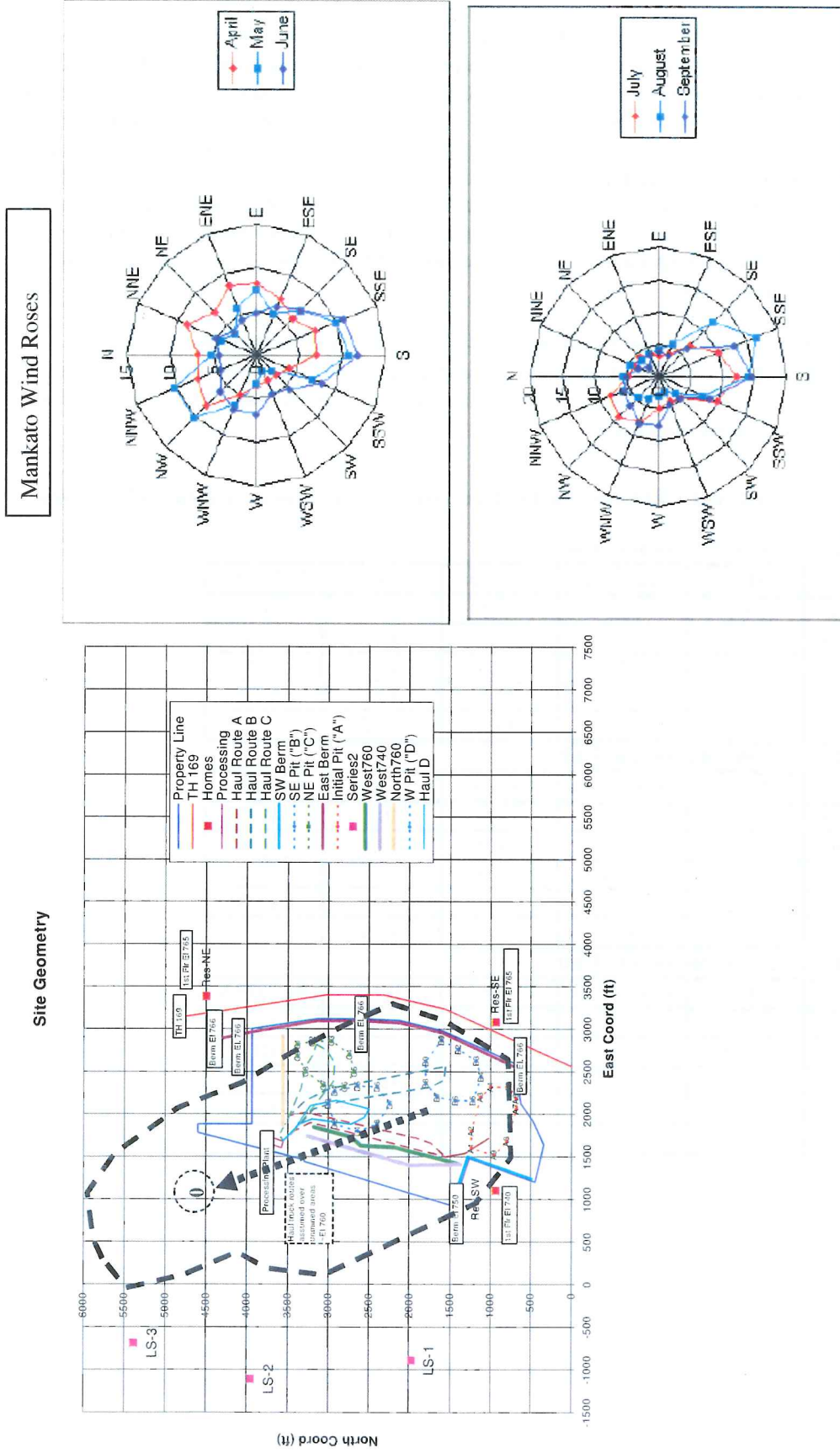


Figure 4.2 Mankato Wind Roses and Prevailing Summer Winds at Mine

Average L50 levels at each of the three Louisville Swamp Unit receptors based upon the nine operating positions around the perimeter of each representative phase are shown in **Table 4.2**. These levels are also combined with haul truck levels and Processing Plant levels to yield overall L50 levels at the three Louisville Swamp receptor sites west of the mine. As in **Table 4.1**, levels for Phase 1 through Phase 4 with topographic shielding at elevation of 760 on the west and the screening berms (Southwest and East) are shown along with levels from Phase 4 once the 760 elevation terrain is removed and the retention pond berm (Elevation 740) remains. It can be seen that the Processing Plant is the dominant source for receptors west of the mine even with some shielding provided by the building and conical piles west of the crusher. The prevailing wind may also reduce these levels.

Predicted total levels are compared with the NAC-1 or residential L50 50 dBA nighttime standard which is the strictest level specified in the state noise rule. It can be seen that the levels at the three Louisville Swamp Unit receptors for all four phases are below 50 dBA and therefore comply with this stringent standard. .

Table 4.2 Predicted L50 Levels (dBA) from Mining Operations on Louisville Swamp

Receptor LS-1 (Louisville Swamp Unit)

Source	Mine	Haul Truck	Crusher	Total	Re50dBA
Phase 1-760	38.1	36.5	43.5	45.2	-4.8
Phase 2-760	37.7	35.4	43.5	45.0	-5.0
Phase 3-760	35.3	32.1	43.5	44.4	-5.6
Phase 4-760	35.9	28.7	43.5	44.3	-5.7
Phase 4-740	39.2	30.4	43.5	45.0	-5.0

Receptor LS-2 (Louisville Swamp Unit)

Source	Mine	Haul Truck	Crusher	Total	Re50dBA
Phase 1-760	36.9	33.3	34.9	40.1	-9.9
Phase 2-760	35.0	32.8	34.9	39.1	-10.9
Phase 3-760	35.1	30.9	34.9	38.8	-11.2
Phase 4-760	35.2	28.6	34.9	38.5	-11.5
Phase 4-740	38.7	30.2	34.9	40.6	-9.4

Receptor LS-3 (Louisville Swamp Unit)

Source	Mine	Haul Truck	Crusher	Total	Re50dBA
Phase 1-760	31.8	29.3	37.5	39.0	-11.0
Phase 2-760	32.2	29.4	37.5	39.1	-10.9
Phase 3-760	40.1	29.0	37.5	42.2	-7.8
Phase 4-760	33.4	27.6	37.5	39.2	-10.8
Phase 4-740	37.6	28.6	37.5	40.8	-9.2

5.0 SOUND LEVEL MITIGATION MEASURES

Some measures that will reduce the potential impact from noise on adjacent residences and the Minnesota Valley are already incorporated into the site plan in **Figure 1.1** and proposed mining operations. These include:

- Limiting mining operation to 7 am to 7 pm (within the daytime period as defined in the state noise rules).
- Employing a loader engineered to reduce both cab and environmental sound levels.
- Constructing a 6-ft high screening berm in the southwest corner with mining operations relatively close to an existing residence.
- Constructing a 6-ft high screening berm along the entire eastern perimeter of the site.
- Using pre-existing processing and rail loading facilities from a previous mining operation on the site.

To ensure that state noise standards will be met the following recommended minor changes to originally planned berm heights have been assumed in the noise assessment and included in a new site plan. Other planned measures not directly modeled but which will minimize impacts from noise and blasting are also listed.

- Increase height of the southwestern berm from 6 ft to 10 ft. This increase has been assumed in the noise assessment since the lower berm could allow an L50 level within a few dBA of the daytime L50 60 dBA limit for mining operations very close to the berm.
- Extend the east screening berm northward to the site entrance. This extension has been assumed in the noise assessment. Maintain the 6-ft height on both the north and south ends of the berm as the natural terrain increases in elevation, which will increase the berm elevation to 775 on the north end.
- Continue to take advantage of stockpiles at the Processing Plant to provide shielding of crusher and dryer noise to the northeast and west. Generalized stockpile areas are shown on **Figure 5.1**.
- Prepare a blast plan to limit blasting to appropriate meteorological conditions as needed to minimize both airborne sound and safety and follow other standard procedures to minimize ground-borne vibration and airborne sound. Include in the plan provisions to notify adjacent persons of planned blasting and monitor initial blasts to ensure that USBM limits are met.
- Use broadband or white noise backup alarms to minimize off-site audibility. Equipment such as manufactured by Brigade Electronics have been MSHA approved and is used at other locations in Minnesota.

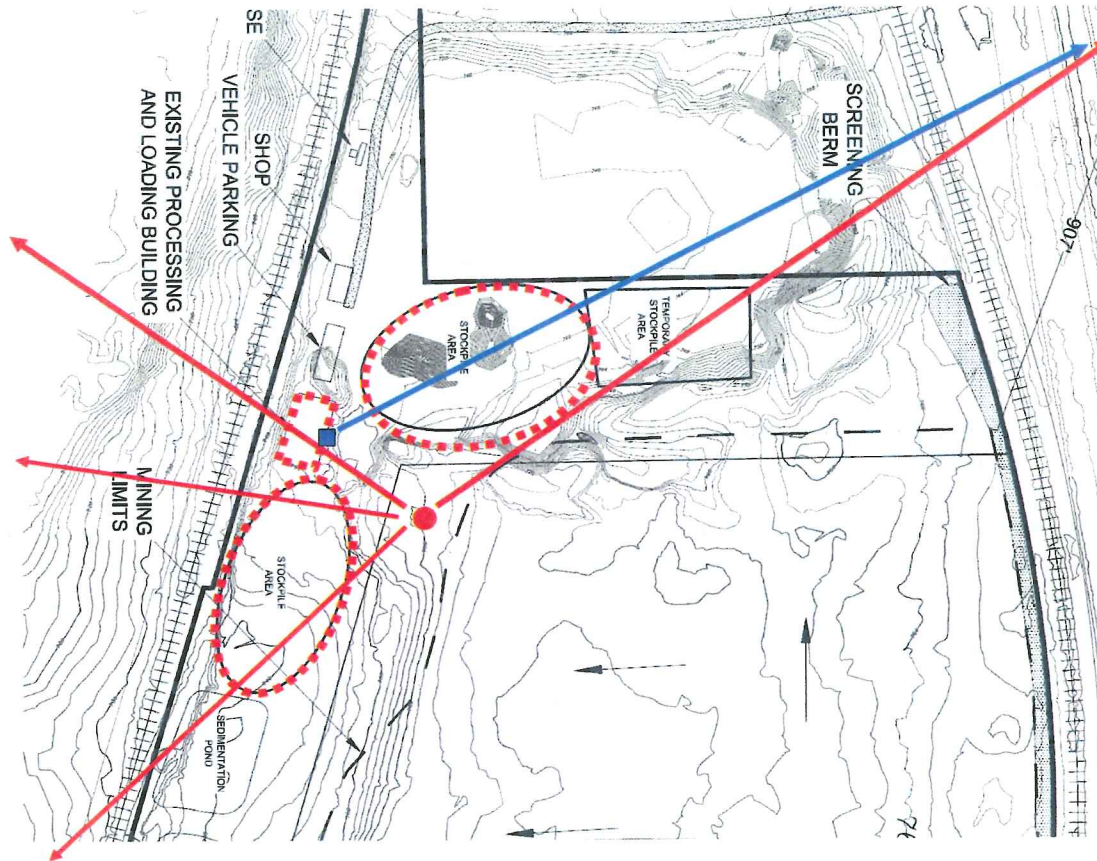


Figure 5.1 Generalized Areas for Stockpile Shielding of Sound at Nearby Receptors

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Sound levels from traffic on TH 169, which runs along the east side of the property, are also estimated for the adjacent residential land uses. Predicted sound levels from the mine site and Processing Plant are compared with these levels to provide a measure of potential impact of the mine relative to existing sound levels

Sound levels are estimated for the most critical equipment working in the area with highest noise levels - the wheel loader, excavator and haul trucks - since they will be operating throughout the day in the mine. The dredge will operate at the lowest accessible mine level. Sound levels are estimated for internal haul truck movements between the mine and the Processing Plant.

The loader, crusher, wet screen and dryer are the primary outdoor sources at the Processing Plant. Sound levels are predicted from the crusher/wet screen/loader area and dryer to be located on the east side of the existing building. Railcar loading is not expected to generate new significant sound levels. Since the Processing Plant will continue operating at night, noise levels from the Processing Plant are compared with the state nighttime noise standards.

None of the predicted levels from mining operations combined with haul truck and Processing Plant levels are estimated to exceed the daytime L50 60 dBA standard. Except for the residential receptor southwest of the site, which is some distance from TH 169 estimated L50 levels from TH 169 levels are already well above the predicted mine-related levels.

None of the predicted levels from nighttime operation of the Processing Plant are estimated to exceed the nighttime L50 50 dBA at residences or in the Louisville Swamp.

Mitigation measures incorporated in the site plan include screening berm, use of some equipment engineered for better sound control, and strategic placement of stockpiles. Additional measures for minimizing noise in the community and the Louisville Swamp Unit include higher berm elevations in some locations, a blasting plan and quieter backup alarms.

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1.0 INTRODUCTION

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Noise Area Classification	Daytime		Nighttime	
Noise Metric	L ₅₀	L ₁₀	L ₅₀	L ₁₀
NAC-1 (residential and sensitive areas)	60	65	50	55
NAC-2 (commercial)	65	70	65	70
NAC-3 (industrial)	75	80	75	80

The NAC-1 or residential noise standards govern the residential land uses adjacent to the proposed mine. The NAC-1 level is also used here as the standard to be met in the Louisville Swamp Unit since this was recommended in the proposed Conditional Use Permit for the Q Prime Amphitheater which was proposed earlier on the same parcel.

“The State of Minnesota's NAC-1 standards shall be met at the residential receptors and the adjacent affected eastern boundary of the Louisville Swamp Unit (LSU) of the Minnesota Valley Wildlife Refuge. Failure to maintain compliance with prescribed standards shall be cause for immediate suspension of scheduled events by the County's Community Development Director and continuing violations shall be grounds for revocation of the Conditional Use Permit by the County Board.”

Operations in the mine are proposed in summer months between 7 am and 7 pm, so the daytime standards apply to this activity. The Processing Plant is proposed to operate on a 24 hour basis 7 days per week both summer and winter so the nighttime standards will apply to plant operation.

The proposed mine layout is shown in **Figure 1.1**.

Sound levels are also estimated for the adjacent residential land uses from TH 169 which runs along the east side of the property. Predicted sound levels from the mining area and Processing Plant are compared with these levels to provide some information on potential impact of the mine relative to existing sound levels.

1.3. Report Components

Section 2.0 describes the equipment and operations at the mine including assumed sound levels associated with the equipment.

Section 3.0 describes the modeling and assumptions used in this study.

Section 4.0 presents and discusses predicted sound levels.

Section 5.0 of this report discusses mitigation measures incorporated into the site plan and operation and others to ensure compliance with state noise standards at adjacent residences and in the Louisville Swamp Unit.

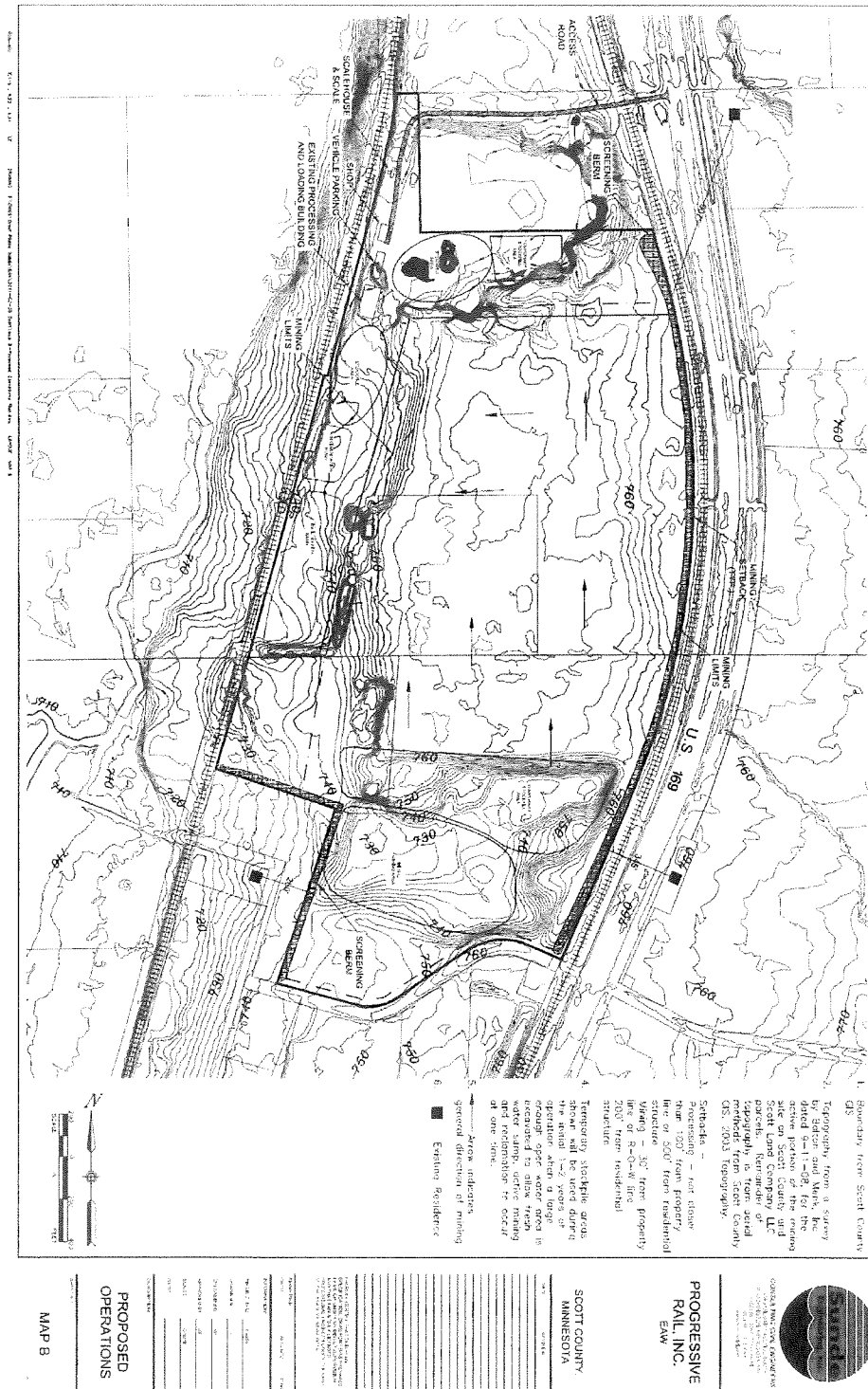


Figure 1.1 Proposed Site Layout

2.0 MINE EQUIPMENT AND OPERATIONS.

The following equipment is anticipated at the mine.

Summer operations

Mining Area

- Drilling for blast holes - intermittent for periods of 15-20 minutes (estimated sound level ~ 70 dBA at 50 ft)
- Blasting - intermittent - several times per week
- On-site haul trucks - approximately 8 trips each hour from the mine area to the processing area and 8 trips back to the mine. (assumed level of 86 dBA at 50 ft)
- Wheel loader – (assumed operating L50 level of 81.6 dBA at 50 ft)
- Excavator (estimated level of 78 dBA at 50 ft)
- Dredge or dragline (operated only at water level – generally at elevation ~730 – estimated level of 78 dBA at 50 ft)
- SureStrike hammer (to break up larger pieces ~15 times per hour – sound level depends on equipment used to transport and hold the hammer - limited impact sound level at 50 ft since radiating surface of sandstone block relatively small).

The most critical pieces of equipment are the wheel loader, excavator and haul trucks since they will be operating throughout the day in or near the mine. The haul trucks will travel to and from the mining area over existing terrain to reach the Processing Plant. The dredge or dragline will operate at the lowest accessible mine level in lieu of at least one of the wheeled or tracked vehicles. The drilling sound level is about 10 dBA lower than the other sources and will not be a major contributor to sound levels. The SureStrike hammer will work with smaller blocks of sandstone which will not radiate much sound. This will likely be mounted to a smaller vehicle with low sound levels. Blasting will be periodic and not a major contributor to the overall noise profile.

Processing Plant

- Dryer - outside and east of the building (estimated level of 85 dBA at 50 ft)
- Wheel loader (estimated level 81.6 dBA at 50 ft)
- Jaw Crusher (sandstone – not hard rock) (estimated level of 75 dBA at 50 ft)
- Wet screen (estimated level of 70 dBA at 50 ft)
- Rail loading (spur line – self propelling – no locomotive needed to move individual cars during the loading process)

The crusher/wet screen/loader and dryer are the primary outdoor noise sources at the Processing Plant. Railcar loading will occur on a sloped track so that a locomotive is not required to move each car. Locomotive activity will occur periodically and will not significantly increase rail traffic on the existing track.

Winter Operations

Processing Plant only

- SureStrike hammer (see above)
- Loader (see above)
- Jaw Crusher (see above)
- Dryer (see above)
- Rail loading (see above)

The loader/crusher and dryer will be the most critical noise generating equipment associated with the Processing Plant.

3.0 NOISE MODELS AND ASSUMPTIONS

3.1. Mine Area Sound Levels

The wheel loader and excavator are the most critical pieces of equipment for predicting sound levels since they can run almost continuously at the mine face and have levels 10 dBA or more above drilling noise. To ensure conservative or worst case sound level predictions, it is assumed that the loader and the excavator operate simultaneously.

Previous sound level measurements of a CAT 988 Wheel Loader at another sandstone mine yielded an L50 level of 81.6 dBA, i.e. the level that was exceeded for 50% of an hour. That level has been used in this study.

For the analysis, it is assumed that the loader and excavator are running simultaneously so that the sound levels of each are combined using decibel addition into a single source of 83.2 dBA with an assumed source height of 10 feet above ground level.

An outdoor sound propagation model incorporating data and recommendations from the ISO standards 9613-1 and 9613-2 has been used to predict sound levels at the three closest residences to the proposed mine. The mine layout and existing topography was shown in **Figure 1.1**. A recent aerial photograph of the site is shown in **Figure 3.1**. The three closest residences are shown on each of the figures. They are identified in the analysis as Res1-SW, Res2-SE and Res3-NE. The Minnesota River Valley and Louisville Swamp Unit is shown on the left. A layout of assumed mining operations is shown in **Figure 3.2**. Predicted sound levels were based upon mining phases (labeled here as A, B, C and D) representing the planned four mine phases. Mine area A, B and C, respectively, are closest to each of residential receptor sites to yield the highest expected levels from mine operations at each of these sites. Sound level predictions have been made for a mine floor elevation of 730 ft MSL which is the initial mining elevation and will remain essentially at this level as mining progresses to the north.

The loader/excavator is assumed to be distributed around the perimeter of each mine area to provide a range of expected sound levels at each of the receptor sites.

A berm at the southwest corner of the property closest to Res1-SW is assumed to be 10 feet high due to the close proximity of operations to the home. With a 2.5:1 slope, the base of this berm will be approximately 50 feet. A second screening berm is assumed along the east property line with a height of 6 feet on a 30 foot base.

3.2. Haul Truck Sound Levels

Internal haul truck roads are also assumed as shown in **Figure 3.2** for each of the four mine areas analyzed. It is assumed that eight truck trips from the mine area to the Processing Plant and back to the mine area are made each hour. Noise from the haul trucks is predicted using the MinnNoise model incorporating the haul truck with a sound level of 86 dBA at 50 feet when traveling at 15 mph. Since the trucks will be operating simultaneously with mining, the sound level from the haul trucks is combined with the mine face noise to yield overall sound levels at the residential sites.

3.3. Processing Plant Sound Levels

The primary noise sources at the Processing Plant will be a crusher with a loader or loader/excavator and dryer which will operate both day and night. The crusher operations will have a relatively low sound level due to softness of the sandstone. The same outdoor sound propagation model used for mine area sources has been used for these sources. Since the Processing Plant will continue operating at night, noise levels from the Processing Plant will be compared with the state nighttime noise standards. Location of the dryer and crusher along with associated stockpiles are also shown on **Figure 3.2**. The dryer is located on the east side of the plant building and is therefore shield from the Louisville Swamp receptors by the building. Conical stockpiles west of the crusher provide some shielding of sound to the west while the larger stockpile area provides some shielding of dryer noise to the east.

3.4. TH 169 Sound Levels

Trunk Highway 169 separates two of the three residential receptor sites from the mining operation and is also a major generator of noise. Hourly traffic volumes for July 2010 for a traffic count location several miles south of the site are shown in **Figure 3.3**. From the figure, it can be seen that, during a typical summer weekday, the minimum two-way traffic during the proposed operating time of the mine (7 am to 7 pm) is about 1250 vehicles per hour. During early morning hours, traffic volumes drop to about 50 vehicles per hour.



Figure 3.1 Site Aerial with Adjacent Residences and the Minnesota River Valley

Site Geometry

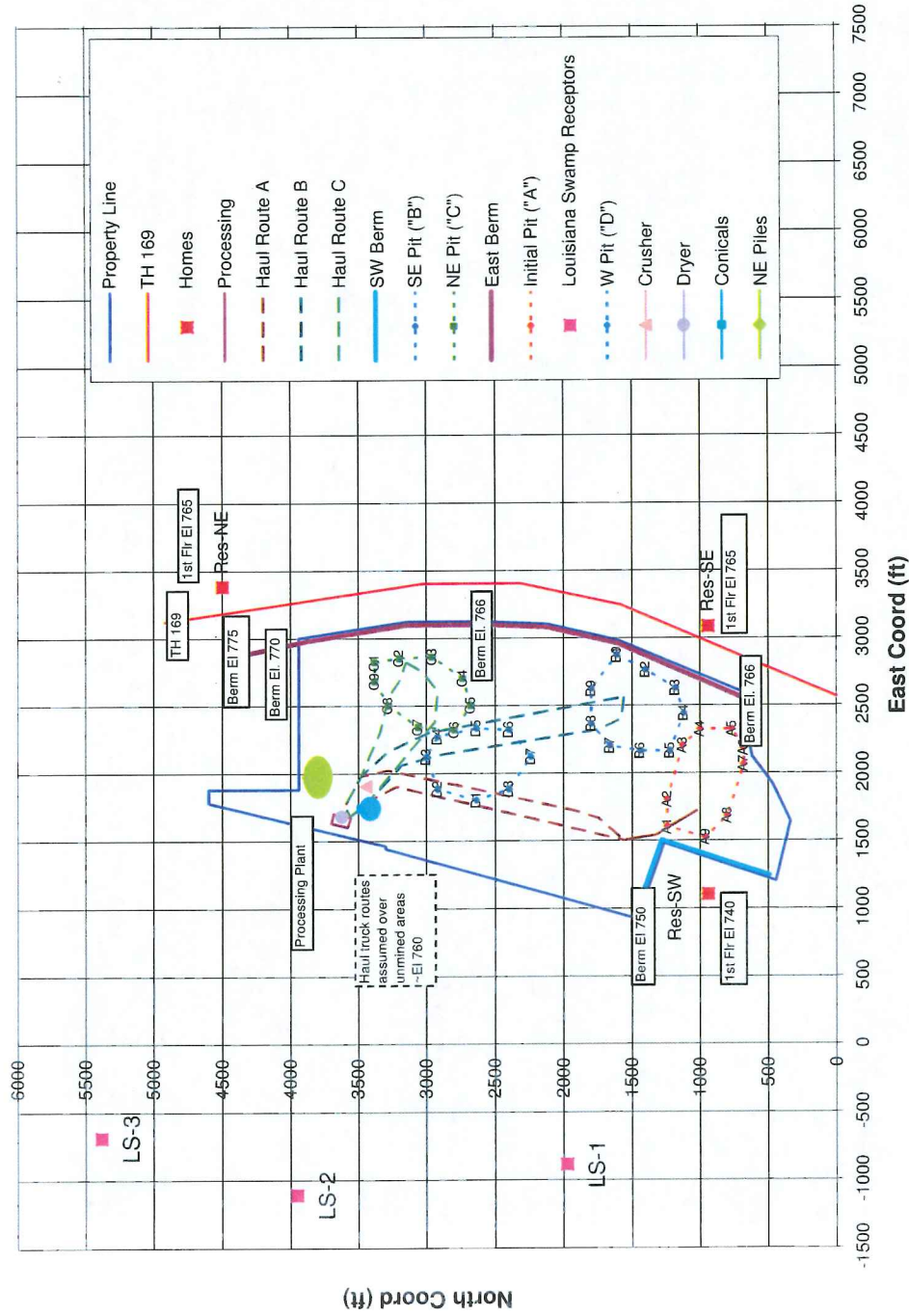


Figure 3.2 Assumed Geometry for Sound Level Monitoring

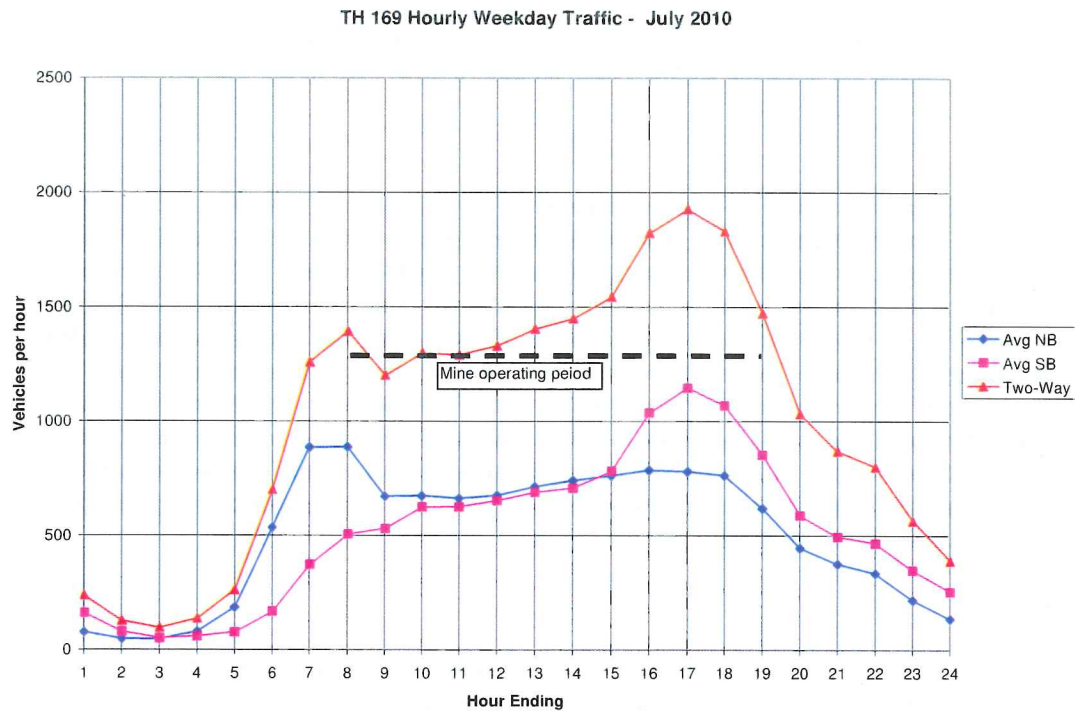


Figure 3.3 TH 169 Hourly Traffic Distribution

4.0 PREDICTED SOUND LEVELS.

4.1 Mining Sequence Considerations in Model Predictions

This noise assessment examines sound levels associated with four consecutive phases of mining. Mining operations are assumed within a defined mine area in each of the four phases.

Phase 1

Mining will begin in a previously mined area with floor elevation of 730, thus providing some immediate shielding from terrain. Haul trucks traveling to and from the Processing Plant will exit the mine area and travel over existing terrain at a typical elevation of 760 [ft]. Screening berms are planned for the southwest corner of the mine as indicated on **Figure 3.2**. These are assumed to be 10 feet above grade (top elevation of 750) to provide shielding of the residence immediately southwest of the mine. Another screening berm with a nominal height of 6 feet (top elevation 766) will extend the entire length of the property just west of TH 169. Because of higher terrain at the north and south ends of the site, the top elevation could reach 775 at each end. Mining operations will occur only during daytime hours 7 am to 7 pm, within the “daytime” period (7 am to 10 pm) contained in the state noise standards. The crusher/wet screen/loader and dryer at the Processing Plant will operate 24-hours.

Phase 2

Mining will proceed to the north from Phase 1 with a floor elevation of 730. Again haul trucks will exit the mine area and travel to and from the Processing Plant at an elevation of 760. The berms erected for Phase 1 will remain in place for this phase. The Processing Plant will operate 24 hours..

Phase 3

Mining will continue to the north from Phase 2 with a floor elevation of 730. Haul trucks will travel a shorter distance to the Processing Plant, again at an assumed elevation of 760. The previously erected berms will remain in place. The Processing Plant will operate 24 hours.

Phase 4

Mining will proceed toward the west from Phase 3. Initial shielding to the west (Louisville Swamp Unit) will be provided by existing terrain at an elevation of 760. Haul trucks will travel primarily at an elevation of 730, climbing to an elevation of 750 at the Processing Plant at the north end of the mine.

Retention ponds will be constructed along the west boundary of the property as shown on **Figure 4.1** with an effective berm of elevation 740 providing less shielding of mining noise to the west. However, with a mine floor elevation of 730 to the east and receptors in the Louisville Swamp Unit at approximately an elevation of 715, this berm will still provide substantial shielding for mining operations. The Processing Plant will operate 24 hours.

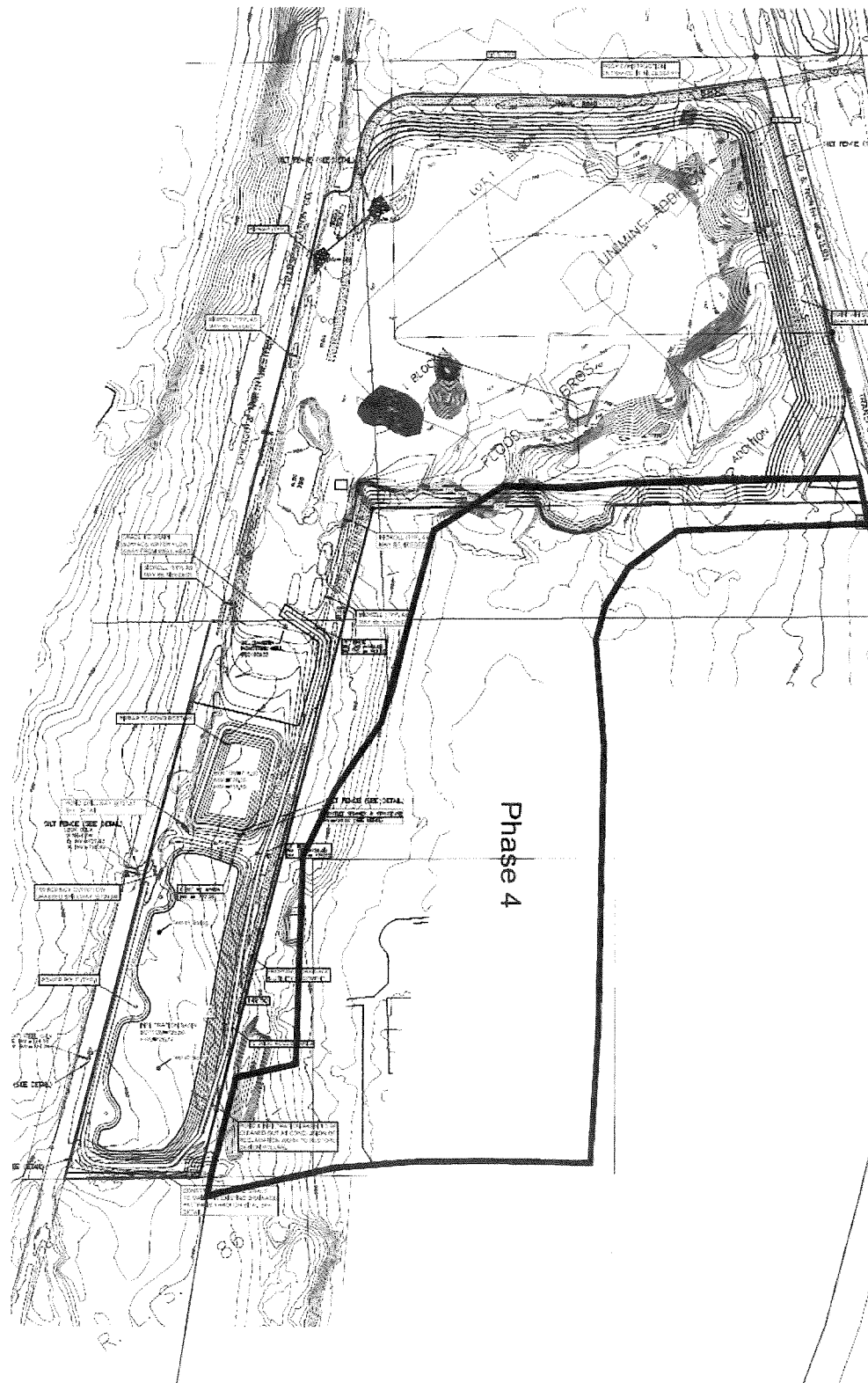


Figure 4.1 Phase 4 and Retention Basins

No permanent shielding of the Processing Plant area is currently planned although strategic placement of stockpiles can serve as temporary berms.

4.2. Predicted Sound Levels

Average L50 levels at each of the residential receptors based upon nine operating positions around the perimeter of each representative mining phase are shown in **Table 4.1**. These are combined with haul truck levels and Processing Plant levels to yield overall L50 levels at the three residential receptor sites. Levels for Phase 1 through Phase 4 with a topographic shielding elevation of 760 on the west and the screening berms (Southwest and East) are shown along with levels from Phase 4 once the 760 terrain shielding is removed and the retention pond berm (Elevation 740) remains. The decibel addition of all three levels (mining equipment, haul trucks and Processing Plant) ensures a conservative estimate of sound level since the prevailing wind during summer months is from the SSE to the NNW as shown in **Figure 4.2**, and therefore, the overall levels are likely to be lower than the total shown in **Table 4.1**.

The combined L50 levels are compared in **Table 4.1** with the predicted L50 level caused by traffic along TH 169 between 7 am and 7 pm. It can be seen that, except for Res1-SW which is a considerable distance from the highway, the highway levels are well above expected daytime levels from the mine. Phase 1 which is closest to Res1-SW shows the highest expected overall level. Predicted mine levels are generally 20 dBA lower than the daytime L10 65 dBA at the residential receptor sites except at Res1-SW during Phase 1 operations. However, it is still predicted to be 10 dBA below the standard. Sound levels from nighttime operations at the Processing Plant are compared with the state nighttime L50 50 dBA standard and found to be below nighttime standards. The critical role of the Processing Plant during nighttime hours can be seen in the table where predicted plant levels range from 45 dBA at Res1-SW to 48 dBA at Res3-NE

Table 4.1 Predicted L50 Levels (dBA) from Mining Operations at Residential Sites

						All Sources	Plant only
Residential Receptor Res1-SW							
Source	Mine	Haul Truck	Plant	Total	TH 169	Re65dBA	Re50 dBA
Phase 1-760	51.4	47.2	45.1	54.8	45.8	-10.2	-4.9
Phase 2-760	46.3	39.1	45.1	49.2	45.8	-15.8	-4.9
Phase 3-760	39.0	32.1	45.1	46.2	45.8	-18.8	-4.9
Phase 4-760	43.4	34.1	45.1	47.5	45.8	-17.5	-4.9
Phase 4-740	43.4	34.1	45.1	47.5	45.8	-17.5	-4.9
Residential Receptor Res2-SE							
Source	Mine	Haul Truck	Plant	Total	TH 169	Re65dBA	Re50 dBA
Phase 1-760	49.3	37.5	44.5	50.8	65	-14.2	-5.5
Phase 2-760	38.6	38.3	44.5	46.3	65	-18.7	-5.5
Phase 3-760	40.7	39.1	44.5	46.8	65	-18.2	-5.5
Phase 4-760	43.8	35.3	44.5	47.4	65	-17.6	-5.5
Phase 4-740	43.8	35.3	44.5	47.4	65	-17.6	-5.5
Residential Receptor Res3-NE							
Source	Mine	Haul Truck	Plant	Total	TH 169	Re65dBA	Re50 dBA
Phase 1-760	36.6	40.7	48.2	49.2	61.8	-15.8	-1.8
Phase 2-760	38.6	41.7	48.2	49.4	61.8	-15.6	-1.8
Phase 3-760	46.5	32.6	48.2	50.5	61.8	-14.5	-1.8
Phase 4-760	42.2	33.6	48.2	49.3	61.8	-15.7	-1.8
Phase 4-740	42.2	33.6	48.2	49.3	61.8	-15.7	-1.8

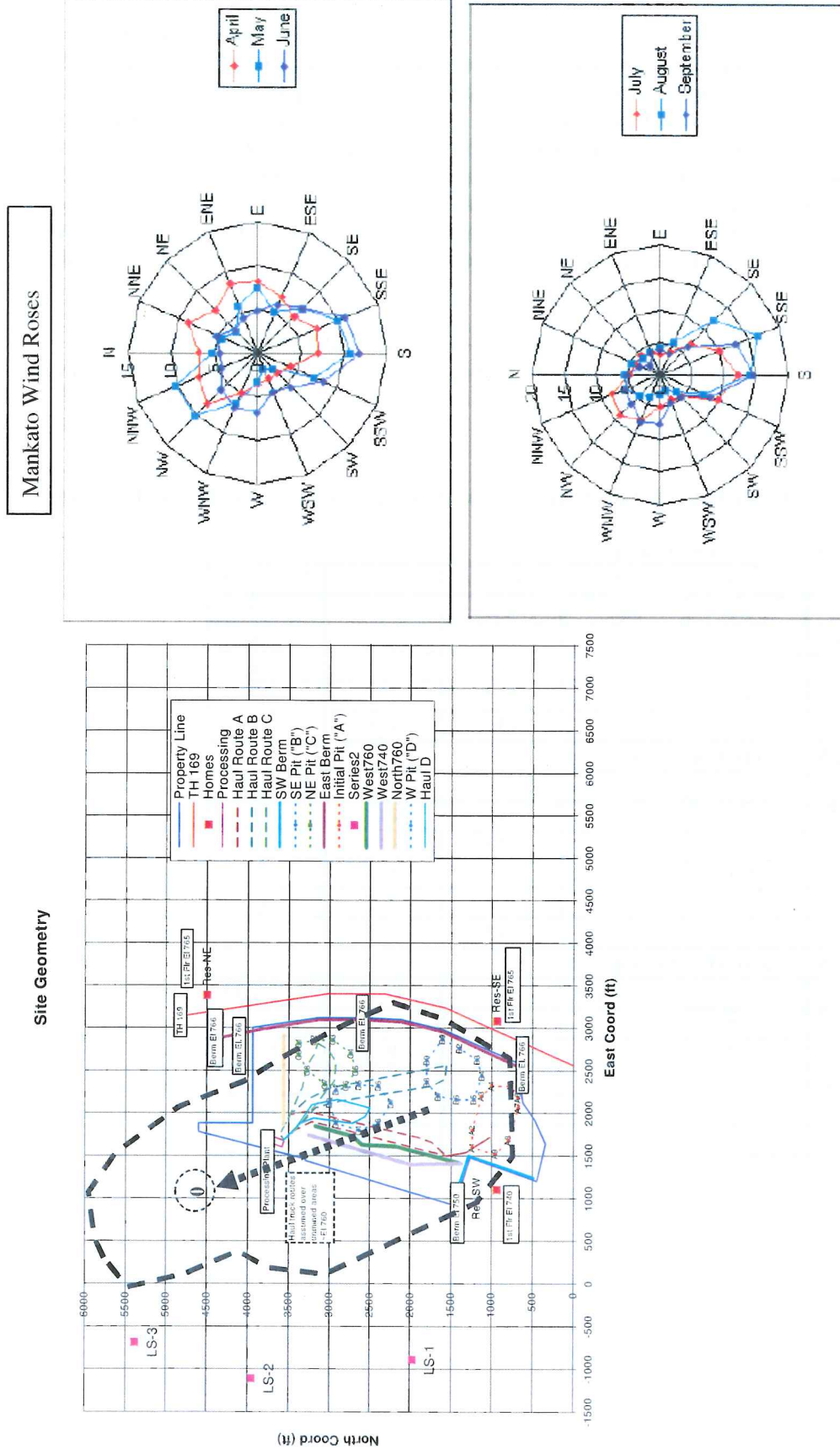


Figure 4.2 Mankato Wind Roses and Prevailing Summer Winds at Mine

Average L50 levels at each of the three Louisville Swamp Unit receptors based upon the nine operating positions around the perimeter of each representative phase are shown in **Table 4.2**. These levels are also combined with haul truck levels and Processing Plant levels to yield overall L50 levels at the three Louisville Swamp receptor sites west of the mine. As in **Table 4.1**, levels for Phase 1 through Phase 4 with topographic shielding at elevation of 760 on the west and the screening berms (Southwest and East) are shown along with levels from Phase 4 once the 760 elevation terrain is removed and the retention pond berm (Elevation 740) remains. It can be seen that the Processing Plant is the dominant source for receptors west of the mine even with some shielding provided by the building and conical piles west of the crusher. The prevailing wind may also reduce these levels.

Predicted total levels are compared with the NAC-1 or residential L50 50 dBA nighttime standard which is the strictest level specified in the state noise rule. It can be seen that the levels at the three Louisville Swamp Unit receptors for all four phases are below 50 dBA and therefore comply with this stringent standard. .

Table 4.2 Predicted L50 Levels (dBA) from Mining Operations on Louisville Swamp

Receptor LS-1 (Louisville Swamp Unit)

Source	Mine	Haul Truck	Crusher	Total	Re50dBA
Phase 1-760	38.1	36.5	43.5	45.2	-4.8
Phase 2-760	37.7	35.4	43.5	45.0	-5.0
Phase 3-760	35.3	32.1	43.5	44.4	-5.6
Phase 4-760	35.9	28.7	43.5	44.3	-5.7
Phase 4-740	39.2	30.4	43.5	45.0	-5.0

Receptor LS-2 (Louisville Swamp Unit)

Source	Mine	Haul Truck	Crusher	Total	Re50dBA
Phase 1-760	36.9	33.3	34.9	40.1	-9.9
Phase 2-760	35.0	32.8	34.9	39.1	-10.9
Phase 3-760	35.1	30.9	34.9	38.8	-11.2
Phase 4-760	35.2	28.6	34.9	38.5	-11.5
Phase 4-740	38.7	30.2	34.9	40.6	-9.4

Receptor LS-3 (Louisville Swamp Unit)

Source	Mine	Haul Truck	Crusher	Total	Re50dBA
Phase 1-760	31.8	29.3	37.5	39.0	-11.0
Phase 2-760	32.2	29.4	37.5	39.1	-10.9
Phase 3-760	40.1	29.0	37.5	42.2	-7.8
Phase 4-760	33.4	27.6	37.5	39.2	-10.8
Phase 4-740	37.6	28.6	37.5	40.8	-9.2

5.0 SOUND LEVEL MITIGATION MEASURES

Some measures that will reduce the potential impact from noise on adjacent residences and the Minnesota Valley are already incorporated into the site plan in **Figure 1.1** and proposed mining operations. These include:

- Limiting mining operation to 7 am to 7 pm (within the daytime period as defined in the state noise rules).
- Employing a loader engineered to reduce both cab and environmental sound levels.
- Constructing a 6-ft high screening berm in the southwest corner with mining operations relatively close to an existing residence.
- Constructing a 6-ft high screening berm along the entire eastern perimeter of the site.
- Using pre-existing processing and rail loading facilities from a previous mining operation on the site.

To ensure that state noise standards will be met the following recommended minor changes to originally planned berm heights have been assumed in the noise assessment and included in a new site plan. Other planned measures not directly modeled but which will minimize impacts from noise and blasting are also listed.

- Increase height of the southwestern berm from 6 ft to 10 ft. This increase has been assumed in the noise assessment since the lower berm could allow an L50 level within a few dBA of the daytime L50 60 dBA limit for mining operations very close to the berm.
- Extend the east screening berm northward to the site entrance. This extension has been assumed in the noise assessment. Maintain the 6-ft height on both the north and south ends of the berm as the natural terrain increases in elevation, which will increase the berm elevation to 775 on the north end.
- Continue to take advantage of stockpiles at the Processing Plant to provide shielding of crusher and dryer noise to the northeast and west. Generalized stockpile areas are shown on **Figure 5.1**.
- Prepare a blast plan to limit blasting to appropriate meteorological conditions as needed to minimize both airborne sound and safety and follow other standard procedures to minimize ground-borne vibration and airborne sound. Include in the plan provisions to notify adjacent persons of planned blasting and monitor initial blasts to ensure that USBM limits are met.
- Use broadband or white noise backup alarms to minimize off-site audibility. Equipment such as manufactured by Brigade Electronics have been MSHA approved and is used at other locations in Minnesota.

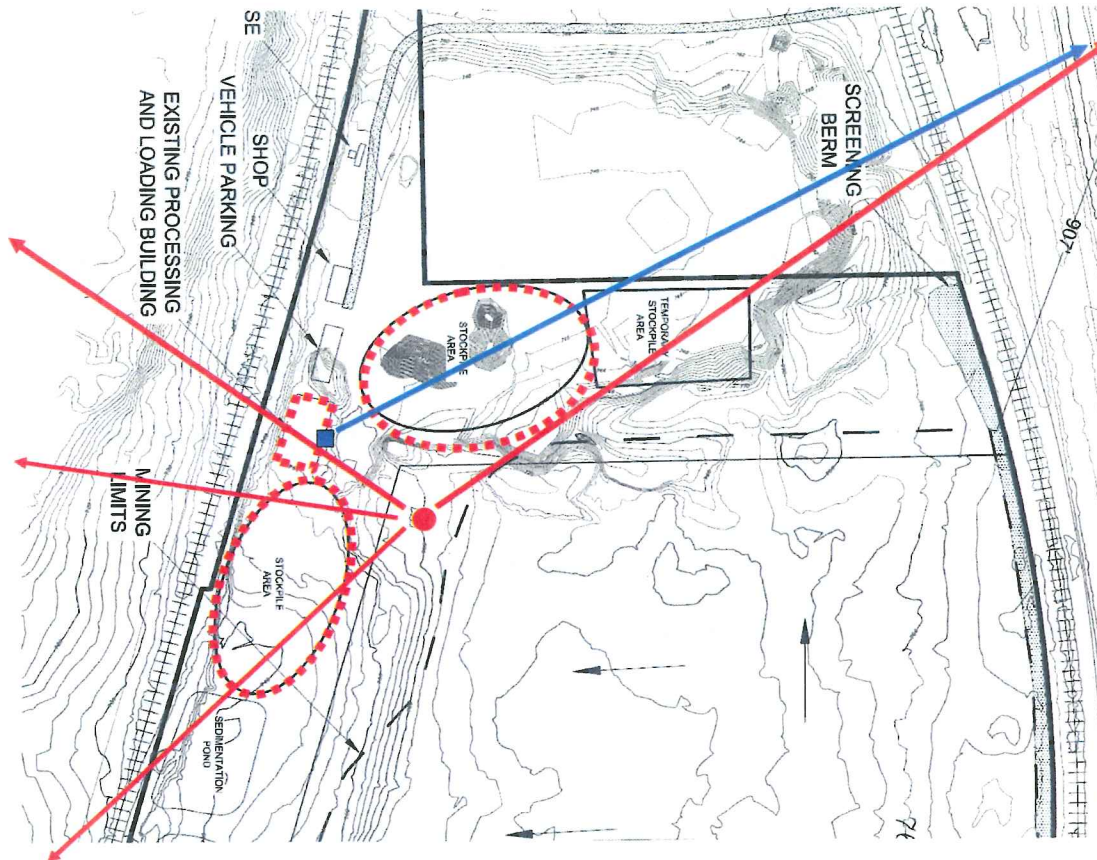


Figure 5.1 Generalized Areas for Stockpile Shielding of Sound at Nearby Receptors